

WHAT IS CLAIMED IS:

1. A method of manufacturing silicide, comprising the steps of:

(a) cleaning a semiconductor substrate with a transistor formed thereon, the transistor including a source electrode, a drain electrode and a gate electrode;

(b) placing the cleaned semiconductor substrate into a sputter chamber in a deposition equipment, and forming silicide at the same time of depositing a metal film under a state where the semiconductor substrate is heated at a temperature of 450 - 600°C;

(c) removing residual metal film not used for the formation of silicide; and

(d) annealing the semiconductor substrate.

2. The method of claim 1, wherein, in the step (b), silicide with a composition ratio of CoSi is formed.

3. The method of claim 2, wherein the step (a) includes a first cleaning step of cleaning the semiconductor substrate using SC1 solution.

4. The method of claim 3, wherein the step (a) further includes a second cleaning step of cleaning the semiconductor substrate using HF or DHF solution.

5. The method of claim 1, wherein the step (a) further includes a third cleaning step of plasma-etching the semiconductor substrate in the sputter chamber.

6. The method of claim 5, wherein the third cleaning step includes a first etching step using RF power of 60 – 90W and a second etching step of RF power of 250 – 350W.

7. The method of claim 5, wherein the third cleaning step uses argon gas of 8 – 15sccm.

8. The method of claim 2, wherein, in the step (b), the semiconductor substrate is heated at a temperature of 450 - 600°C.

9. The method of claim 8, wherein, in the step (b), the metal film is formed by using a cobalt sputter with DC power of 2 – 10kW.

10. The method of claim 8, wherein, in the step (b), argon gas of 40– 70 sccm is used as gas for a sputtering process, and argon gas of 8 – 15sccm is used as gas for heating the semiconductor.

11. The method of claim 2, wherein the step (c) includes a first removal step of removing the metal film during 5 – 15 minutes in SPM solution at a temperature of 50 - 150°C and a second removal step of removing the metal film during 3 – 10 minutes in SC1 solution at a temperature of 40 - 70°C.

12. The method of claim 2, wherein the step (d) includes heating the semiconductor substrate during 10 – 60 seconds at a temperature of 700 - 950°C in a RTP equipment.

13. The method of claim 2, wherein the step (d) includes heating the semiconductor substrate during 20 – 60 minutes at a temperature of 500 - 900°C in an electric furnace.

14. The method of claim 2, wherein, the silicide annealed in the step (d) comprises a composition of CoSi_2 .

15. A semiconductor device with the silicide manufactured according to any one of the preceding claims 1 to 13, comprising:

a semiconductor substrate including device isolation regions;

transistors provided in respective device regions of the semiconductor substrate, each of the transistors including a gate electrode, a source electrode and a drain electrode;

a PMD (pre-metal dielectric) provided on the semiconductor substrate, the PMD including contact holes to expose a portion of regions of the gate, source and drain electrodes;

contacts provided within the contact holes;

metal wire layers provided on the PMD and connected to the contacts; and

silicide with a composition of CoSi_2 provided in the transistors so that contact resistances of the contacts are reduced.

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16. The semiconductor device of claim 15, wherein the silicide comprises a composition of CoSi_2 .